

# Accelerating the Transition from PC Platforms to IA Products

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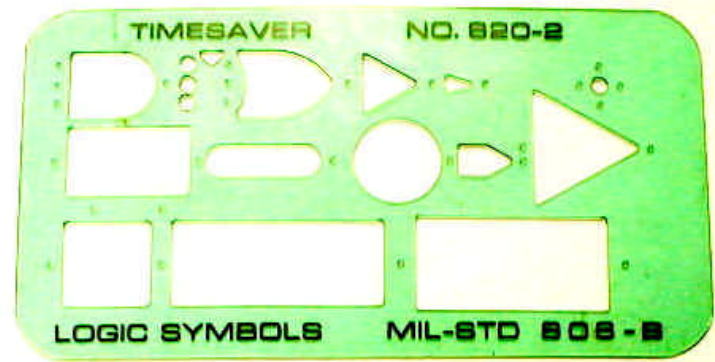
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# An Illustration

- 20 years ago.....as the PC platform started
  - Digital communications: 300 bits / second
  - CPU performance: < 1 MIP
  - Storage: 320KB floppy disk



- Design automation tools were plastic logic templates!

Even then, an intermediate engineer could design and system integrate a PC platform compatible computer

# The PC Platform

- Originated by IBM as system integration platform
  - Every purchaser received the electrical schematics BIOS source code, bus specifications, etc.
- For 20 years...
  - Intel & Microsoft (the two largest stakeholders) have stewarded its orderly & compatible evolution
  - Open platform for anyone to profit from adding value
  - Continuous growth in capabilities keep it vital

# The Success Factors

- The PC Platform succeeds because...
  - It is a system integration platform
  - It is within the capabilities, tools & budgets of **most** design organizations to participate
  - It is based on industry standard (compatibility) vs. proprietary standard (license)
  - It has an active stewardship to coordinate evolving baseline targets & compliance standards
  - The design industries have evolved to meet its needs
  - It is flexible enough to offer the best solution for many broad market needs

# The Rise of the Internet

- 6 Years ago...  
...the Internet moved from academic tool to business tool
- 3 years ago...  
...the Internet becomes the basis for  
a completely connected world!
- Today...  
...the Internet is spawning it's own demand for new services and information appliances that will grow beyond the PC platform

# The Projections

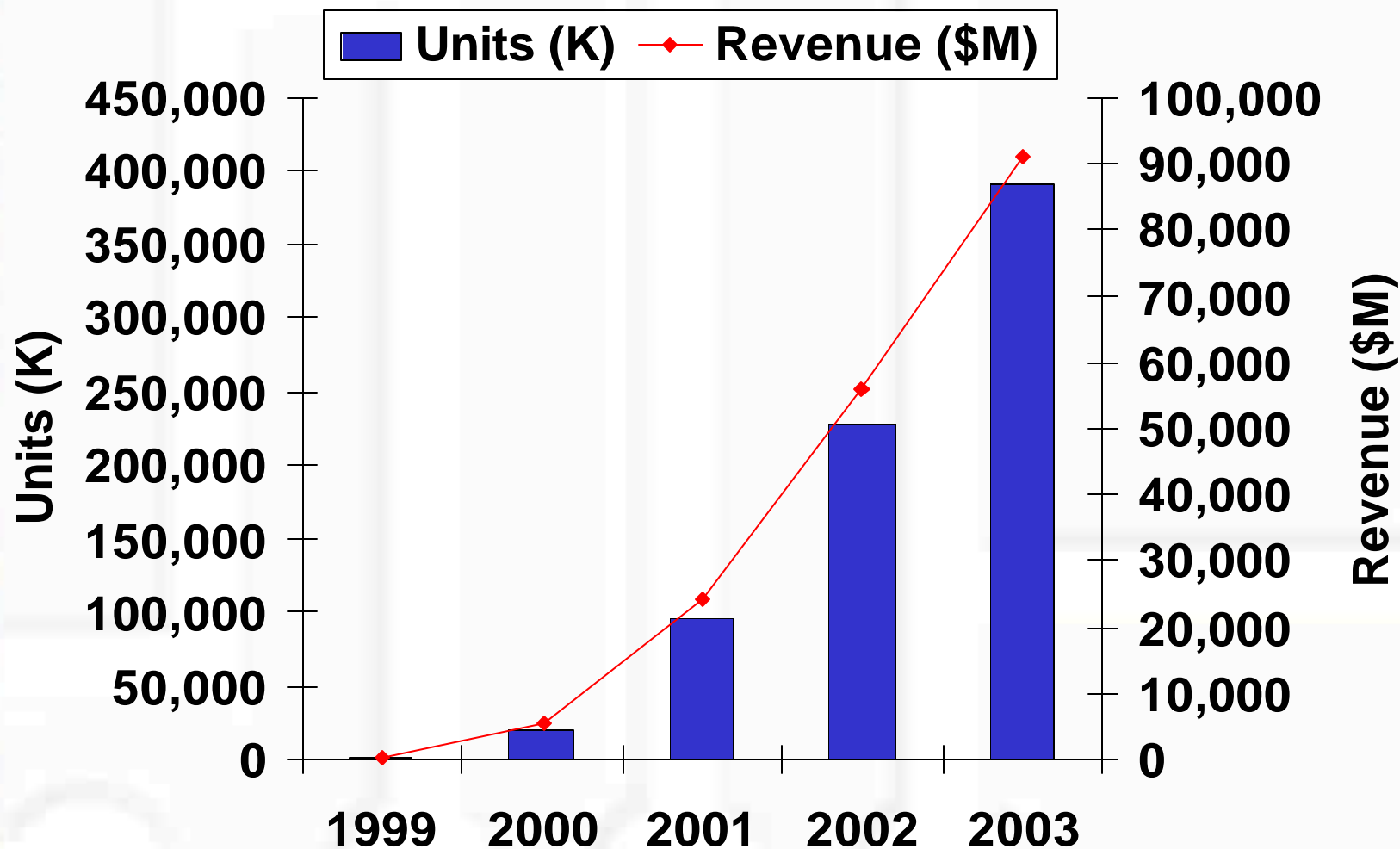
- The Information Appliance Market is expected to...
  - grow at a much faster rate than PC
  - produce an unlimited variety of specialized products
  - support multiple system architectures and markets
- Information Appliances are forecast to drive the next electronics revolution

# New Wave of Information Appliance Products

- All consumer electronics and appliances will be redesigned to become smart and connected
- New categories of products will emerge providing information wherever and whenever desired

“This is just the leading edge of a massive wave of products that will hit in the next few years. Digital media are breaking free of the bonds of the PC.” Michael Slater, *Principal Analyst at Cahners Microdesign Resources*

# Worldwide Information Appliance Production Forecast



Dataquest, IA Forum; April 2000



# PC to IA feature comparison

- PC
  - Expandable, Multifunction
  - Inherent complexity
  - Difficult, costly to support
  - Cannot optimize for all functions
  - Complex, less reliable
  - Lots of baggage
  - Mature
  - System-On-Board
- Information Appliance
  - Limited or specific function
  - Complexity limited to task
  - Easy to support
  - Optimized for specific functions
  - Simple, highly reliable
  - New start
  - Infant
  - System-On-Chip

# PC to IA platform comparison

- PC
  - Easy system integration
  - Straightforward design
  - Industry standards
  - Active stewardship
  - Product certification
  - Established design cycles
  - Mainstream design
  - Flexible end-product
  - System-On-Board
- Information Appliance
  - Rigid HW System
  - Extremely difficult, risky
  - Proprietary standards
  - Limited support
  - Few compliance standards
  - Consumer driven schedules
  - Immature SOC design
  - Fixed/limited end-product
  - System-On-Chip

# Opportunity & Challenge

- The Information Appliances is expected to be the next driver for the electronics industry
  - Silicon and Product technology
  - Manufacturing capability
  - Design capability
- To produce and deploy these new devices
  - Will stress our electronics design capacity
  - Will redefine the rules of product design.

# Challenges to Information Appliance Growth

- Compressed product development cycle
- SOC design process
- Internet/Communications Infrastructure
- Legal & Security
- Standards and Compliance
- Market Segmentation
- Other ....

There is no Information Appliance Platform

# Information Appliance Issues

Information Appliances reflect the “consumerization” of electronic products

Drives fundamental changes to the design process:

- Demands SoC ASIC integration to meet consumer price pressure
- Demands short development time to meet consumer product time-frames
- Demands feature and performance flexibility to meet consumer market demands

The ability to quickly react to markets and competitors is necessary to stay in business

# System-On-Chip Product Issues

- In this new IA marketplace, the delays, risk and rigidity of the current SOC design process become unacceptable
- Evolving requirements and short product life demands end-silicon flexibility
- Emerging standards and converging technology complicate this problem even further.

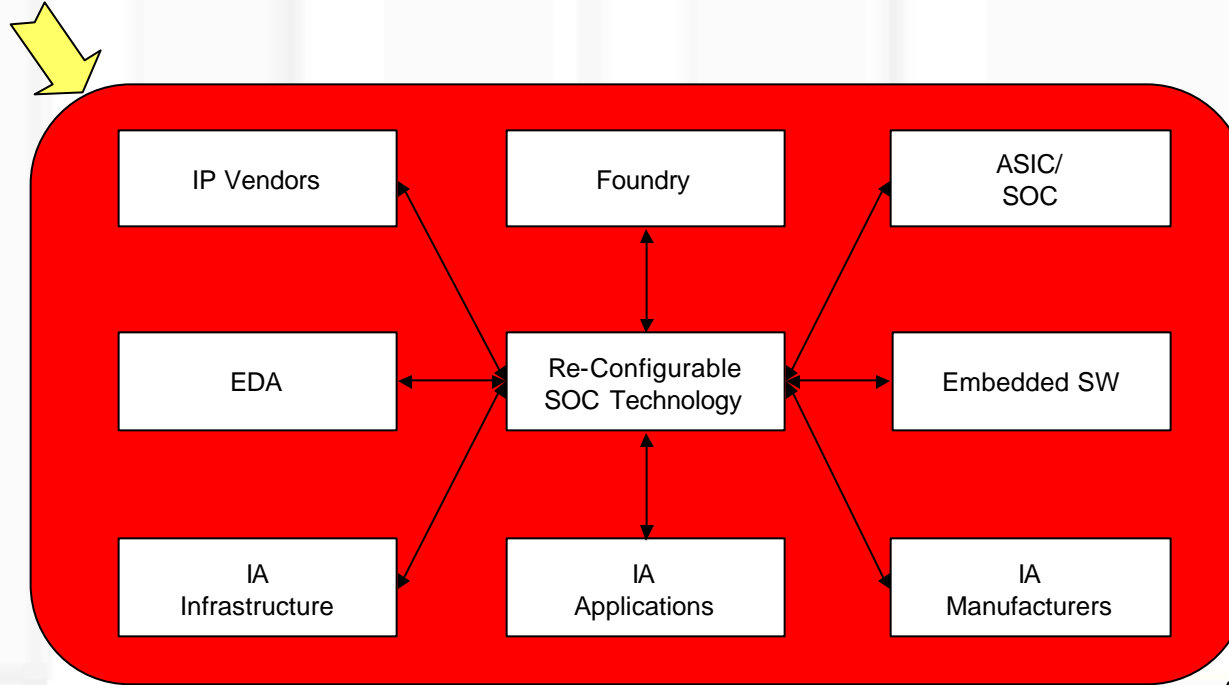
# Accelerating Information Appliances

- The industry will require tremendous improvements in product design efficiency
  - To quickly address this IA opportunity
  - To maintain the pace of growth into the future

If we can establish a broad competency in IA products, we can provide a firm foundation for continued IA market growth

# Information Appliance Platform

IA Concepts to ...



Enabling IA Industry Growth

IA Products  
under 6 mo.



# IA Infrastructure

- Infrastructure
  - Communications and Internet
  - Information Services
  - E-Commerce Services
- Acceleration Potential
  - Standards to enable rapid IA deployment
    - Compliance verification
  - Specified IA terminal interfaces
    - Allows rapid product deployment of compatible devices
    - Allows rapid feature evolution

# IA Manufacturers

- OEMs who produce the consumer IA products
  - These OEMs deal with rapidly changing consumer tastes to deliver products on consumer timeframes
- Acceleration Potential
  - Compliance standards & certification
  - Re-configurable IA devices providing System Integration capabilities
    - Rapid product deployment
    - Multiple products from single SOC device
    - Selectable feature authorization
    - Remote diagnostics and repair

# IA Applications

- IA Applications provide custom information and e-commerce transaction services to a broad range of IA devices
- Acceleration Potential
  - Defined IA SW requirements & standards
  - Re-configurable IA devices will allow:
    - Improved compliance of new IA devices
    - ability to add new application services
    - better quality of service

# SoC & IA Observations

“Programmable solutions hold the key! Inflexible, hard-wired solutions cannot meet the time-to-market needs of the OEMs.”

-- Jay Srivatsa, Dataquest; IAForum: April, 2000

“Success in this market all comes down to cost, time-to-market and the ease of re-configuring the device for the next product.”

-- Richard Wawrzyniak, Semico Research.

# ASIC/SOC Vendors

- ASIC/SOC vendors provide the IA SOC solutions
  - They combine IP cores with software in an optimized silicon-based system architecture
  - They invent and implement the new product concepts
- Largest acceleration from re-configurable logic
  - Order of magnitude better engineer\*time per project
  - Reusable devices tuned for multiple IA products
  - Fewer design iterations
  - Better optimized features and performance
  - Broader design capability

# IP (Intellectual Property) Vendors

- IP cores provide the proven functional blocks for Information Appliance products
  - e.g. Processors, interfaces, protocols
  - Digital and analog functions
- Acceleration potential
  - Commercially available, proven IP cores
  - Re-configurable “sockets”
    - Performance and feature optimization at product level
    - Rapid integration of new IP cores
    - Easy interface repair and tuning

# Semiconductor Foundry

- Foundries manufacture the System-On-Chip devices for Information Appliances that provide:
  - Tremendous connectivity, performance and features
  - Rapidly shrinking prices for consumer product volume
- Acceleration potential
  - Shorter prototype silicon cycles
  - Lower device engineering costs
  - Available IP cores
  - Available re-configurable logic for multi-product reuse

# EDA Vendors

- EDA vendors provide design tools and flows to create IP cores, SOC devices for IA products
- Acceleration potential
  - Simpler tools usable by broad population of designers
  - Tool support for re-configurable logic blocks
  - EDA design environment for

“....Outside this industry there's an order of magnitude more stuff people would love to do, but only a very small fraction of those ideas get done. The gap between those plans and their implementation is due to the lack of good SoC methodologies”

-Joe Costello, *EDA Industry Leader*, IP2000



# Embedded SW

- Embedded SW:
  - OS provides management of the IA system and drivers
  - Application provides functionality and user interface
- Acceleration Potential
  - Faster OS ports and better performance with re-configurable interfaces
  - Standard interfaces to enable Plug-n-Play hardware capability
  - App SW development support for embedded SOC

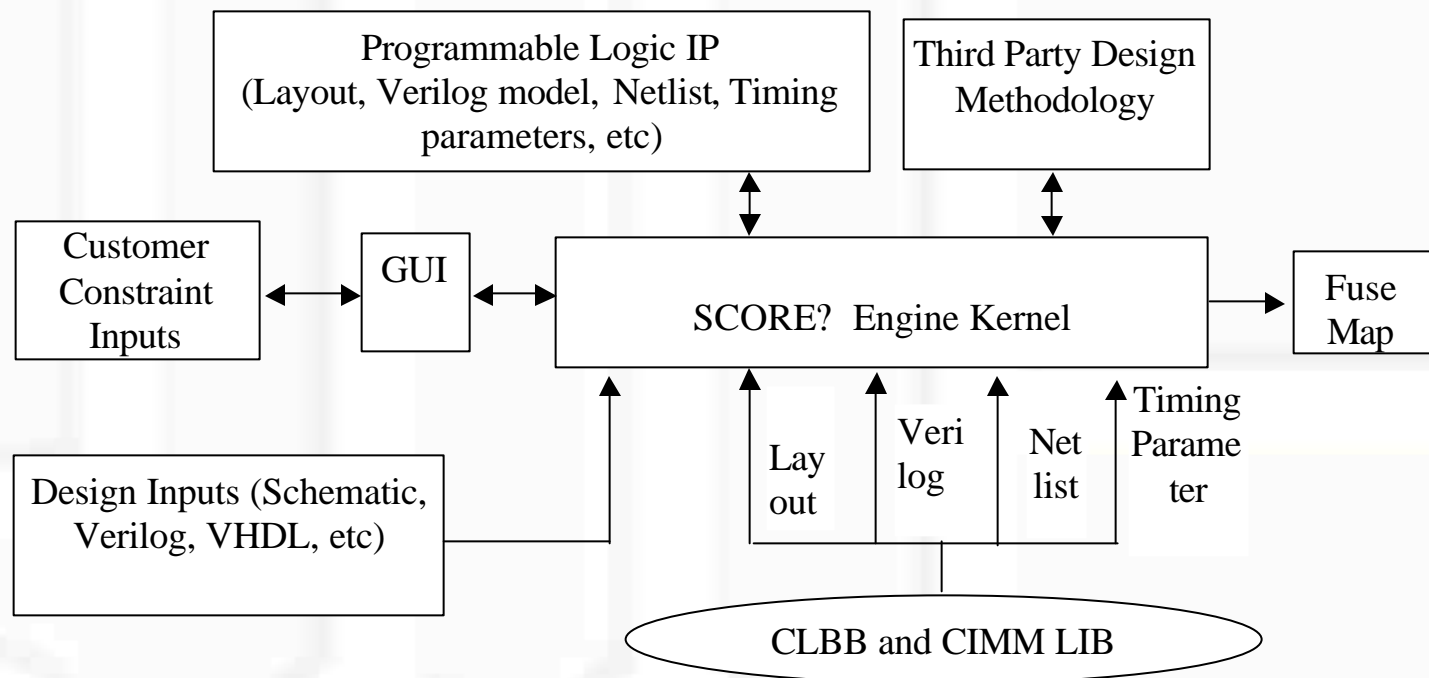
# Re-configurable SOC as Catalyst

IA Product	Multi-Chip	Fixed SOC	Re-configurable SOC
Cost, Power, Size	Moderate	Very Low	Very Low
Engineering Emphasis	Application	Tools & Sim	Application
Design Time, Cost & Risk	Low	Very High	Moderate
HW Design Schedule	< 0.5 Year	> 1.5 Year	< 0.75 Year
SW Integration, Product Flexibility & Reuse	Good	Poor	Moderate

Re-configurable SOC provides the optimal combination of cost, design time and flexibility for consumer markets

# Integrated into Design Process

- SCORE? Compiler overview



# Next Steps

- Push the SOC design process to support IA product design
- Provide broad access to commercial Re-configurable SOC technology and IP cores
- Employ experience from PC platform success to build IA market foundation
- Establish infrastructure among IA industries to ensure successful platform evolution